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Evaluation of Different Fungicides for the Control of Die-Back Disease of Rose Caused by *Botryodiplodia theobromae* Pat. *In vitro*

Hanwant Kumar*

Department of Plant Pathology, SDAU Sardarkrushinagar

D S Patel, Professor of Plant Pathology at C.P. College of Agriculture, SDAU, Sardarkrushinagar

Dr. Kanti Lal, SKRAU, Bikaner

*Corresponding Author E-mail: h_dewasi@yahoo.co.in

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ABSTRACT

Rose (Rosa spp., Family: Rosaceae) is one of the nature's beautiful creations and is universally acclaimed as "Queen of flowers". Rose is affected by several fungal, bacterial, and viral diseases. Among all the fungal diseases, die- back in one of the serious disease throughout the country caused by Botryodiplodia theobromae Pat. In vitro screening of fungicides was carried out by poison food technique, which indicated that systemic group Carbendazim, Thiophanate methyl, Benomyl and in non-systemic group mancozeb and in combined group Carbendazim + Mancozeb were found highly toxic to B. theobromae.

Key words: *Rose, Carbendazim, Thiophanate methyl, Benomyl*

INTRODUCTION

Rose is affected by several fungal, bacterial, and viral diseases. The important fungal diseases are die – back *Diplodia rosarum*[14], powdery mildew *Spheroththeca pannosa* var. *rosae* (Wallr.) Lev[6], rust *Phragmidium buleri* syd[2]. botrytis bud and twig blight *Botrytis cinerea* (Pers.) Fries[3], black leaf spot *Diplocarpon rosae* (Walf.)[1], leaf blight *Alternaria alternate*[8]. Among all the fungal diseases, die- back in one of the serious disease throughout the country caused by *Botryodiplodia theobromae* (Pat.) Colletotrichum gloeosporioides (Penz.), Fusarium solani (Mart.) Sacc. and Diplodia rosarum[4, 5, 6, 12, 16].

Considering the seriousness of the problem and economic importance of the crop, the present investigation was under taken to provide information for devising suitable economical control measures to minimize the losses and to generate scientific information's on following aspects under north Gujarat agro climatic zone. Srivastava and Tandon[15] tested the efficacy of certain fungicides and one antibiotic against the four isolates of *B. theobromae* responsible for rotting of mango and other fruits and found that Captan and antibiotic Nystatin were effective against all isolates. Sabalpara[10] reported that Bavistin and Benlate *in vitro* effective against *B. theobromae*, a cause of dieback of mango. The mycelial growth of *C. gleosporioides* and *B. theobromae* causing mango fruit rot inhibited completely by Carbendazim (400 ppm), followed by Captan (450 ppm), Thiophanate methyl (450 ppm), Zirum (600 ppm) and Chlorothalonil (650 ppm).

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Thakore (1983) reported that Bavistin (0.025 %), Brestanol (0.2 %), Benlate (0.025 %), Calixin (0.025 %) and Dithane M-45 (0.05 %) were most effective for the growth inhibition of *B. theobromae*, a cause of post-harvest rot of sapota. Carbendazim (300; 500; 1000 ppm) and Foltaf (1000; 2000; 3000 ppm) inhibited the mycelial growth of *B. theobromae* a cause of twig decline of sapota[7]. Singh *et al.*[13], evaluated efficacy of six fungicides against *B. theobromae* causing canker and dieback of pear and found that Bavistin and Aureofungin at 200 ppm concentration were inhibitory the pathogen.

MATERIAL AND METHODS

To study the bio-efficacy of different fungicides against *B. theobromae* in laboratory, the poison food technique was employed with PDA. Systemic fungicides were tested at 100, 250, 500, 750 and 1000 a.i. ppm concentration, while non-systemic fungicides at 1000, 1500, 2000, 2500, and 3000 a.i. ppm concentration and combination of systemic and non-systemic fungicides at 500, 1000, 1500, 2000 and 3000 a.i. ppm concentrations. The fungicides employed are listed in table. The measured quantities of fungicides were incorporated in malted sterilized PDA medium aseptically to obtained desired concentration of the fungicide at the time of pouring the medium. The medium is to give uniform dispersal of the fungicides and poured into sterilized Petri dishes under aseptic conditions. The Petri dishes were inoculated at the centre by placing eight days old mycelial disc of 4mm diameter and then incubated at 27 ± 2ºC temperature for eight days. Simultaneously, a control is also maintained by growing the fungus on fungicides free PDA medium. After eight days, an observation on radial mycelial growth of fungus is recorded. The per cent inhibition growth of the fungus in each treatment in comparison with control is calculated by the following equation.

$$PGI = \frac{C - T}{C} \times 100$$

Where,

C = Colony diameter in control (mm)

T = Colony diameter in treatment (mm)

Table 1: Fungicides/ Chemical tested against *B. theobromae* under *in vitro* conditions

Sr. No.	Technical name	Trade name	Concentration (ppm)
Systemic fungicides			
1.	Carbendazim	Bavistin 50 WP	50,100, 250, 500 and 1000
2.	Thiophanate methyl	Topsin-M 70 WP	
3.	Difenconazole	Score 25 EC	
4.	Benomyl	Benlate 50 WP	
5.	Propinconazole	Tilt 25 EC	
6.	Hexa conazole	Contaf 5 EC	
7.	Fosetyl - AL	Allied 80 WP	
8.	Tridemorph	Calixin 80 EC	
Non systemic fungicides			
9.	Mancozeb	Dithane M- 45	500, 1000, 1500, 2000 and 3000
10.	Chlorothalonil	Kavach 75 WP	
11.	Copper oxychloride	Blitox 50 WP	
12.	Captan	Captan 50 WP	
Compound fungicides			
13.	Caboxin + Thiram	Cosco 75 WP	100, 250, 500, 1000 and 1500
14.	Mancozeb + Carbendazim	Sixer 75 WP	
15.	Metalaxyl + Mancozeb	Ridomil MZ 72 WP	

RESULTS AND DISCUSSION

Screening of fungicides *in vitro* proved first hand information about its efficacy against a pathogen. This is very useful in saving the time, labour and money of testing in the field. In the present investigation, eight systemic, four non- systemic fungicides and three compound fungicides (systemic + non-systemic) fungicides at different concentrations were tested *in vitro* for their

comparative efficacy against inhibition of mycelial growth of *B. theobromae* through poison food technique. The results thus obtained are presented in table 1, 2 and 3.

All the eight systemic fungicides at 50 to 1000 ppm concentrations were found inhibitory to the fungal growth. Significantly the highest mean growth inhibition of the fungus was recovered by carbendazim, thiophanate methyl and Benomyl. At 50 ppm concentration, carbendazim, thiophanate methyl and Benomyl showed cent percent fungus growth inhibition. At 500 ppm concentration propiconazole inhibit the cent percent fungus growth, whereas fosetyl AL inhibited cent at 1000 ppm completely inhibit fungus growth.

Non- systemic fungicides at 500 to 3000 ppm concentrations were found inhibitory to the fungal growth (Table. 13). Significantly Mencozeb inhibited maximum mean fungal growth (81.90 %) which was followed by chlorothalonil (67.90 %), and copper oxychloride (45. 20 %). The the poor inhibitory fungicide was Captan which was inhibited 32.10 per cent mean fungal growth. Inhibitory effect of all the non- systemic fungicides increased positively with increasing concentrations of the fungicides.

Also compound (systemic + non-systemic) fungicides at different concentration (100 to 1500 ppm) were found inhibitory to the fungal growth. Significantly, the cent percent mean growth inhibition of the fungus was recorded by Mancozeb + Carbendazim followed by Metalaxyl + Mancozeb (96.67 %). Significantly least mean fungal growth inhibition (54.67 %) was recorded by Caboxin + Thiram. At 100 ppm concentration, Mancozeb + Carbendazim completely inhibited the fungal growth. The compound fungicide Metalaxyl + Mancozeb inhibited cent percent fungal growth at 500 ppm concentration.

Effectiveness of different fungicides for inhibition of *B. theobromae* have been reported by many research workers. Sabalpara[10] reported that Bavistin and Benlate *in vitro* effective against *B. theobromae.* Carbendazim (300; 500; 1000 ppm) and Foltaf (1000; 2000; 3000 ppm) inhibited the mycelial growth of *B. theobromae* a cause of twig decline of sapota[7]. Singh *et al*[13]., evaluated efficacy of six fungicides against *B. theobromae* causing canker and dieback of pear and found that Bavistin at 200 ppm concentration was inhibitory the pathogen. Rakholiya *et al*[9], observed mean lowest disease intensity in Cardendazim (0.1%) treatment as compared to control. Sharma and Badiyala[11] observed that carbendazim (0.1%) were effective to check the post harvest decay of mango fruits

Table 1: Per cent growth inhibition of *B. theobromae* by systemic fungicides at different concentrations *in vitro*

Sr. No.	Common name	Trade name	Per cent growth inhibition* Concentration (ppm)					
			50	100	250	500	1000	Mean
1.	Cabendazim	Bavistin	100.00 (90.00)**	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00
2.	Thiophanate methyl	Topsin-M	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00
3.	Difenconazole	Score	41.48 (37.01)	63.7 (54.69)	76.3 (61.89)	85.59 (68.26)	87.41 (78.17)	70.90
4.	Bynomyl	Benlate	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00
5.	Propiconazole	Tilt	88.89 (79.06)	92.22 (82.21)	94.08 (83.32)	100.00 (90.00)	100.00 (90.00)	95.04
6.	Hexa conazole	Contaf	77.78 (69.39)	78.89 (70.39)	83.7 (74.83)	87.78 (78.28)	93.7 (83.31)	84.37
7.	Fosetyl AL	Allaide	39.63 (33.84)	79.64 (64.95)	86.67 (77.46)	93.7 (83.65)	100 (89.39)	79.93
8.	Tridemorph	Calixin	75.92 (65.39)	77.4 (70.09)	83.33 (74.39)	90.37 (80.73)	93.33 (83.19)	84.07
Mean			77.96	86.48	90.51	94.68	96.805	
S. Em. ±			1.21					
C.D. at 5 %			3.41					
C.V.%			0.59					

* Average of three replications

** Figures in parentheses are arcsine transformed values

Table 2: Per cent growth inhibition of *B. theobromae* by Non- systemic fungicides at different concentrations *in vitro*

Sr. No.	Common name	Trade name	Per cent growth inhibition* Concentration (ppm)					
			500	**1000**	**1500**	**2000**	**3000**	Mean
1.	Mancozeb	Dithane M-45	45.19 (40.40)**	64.07 (57.27)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	81.9
2.	Chlorothalonil	Kavach	48.15 (43.04)	61.48 (54.96)	72.22 (64.56)	73.33 (65.55)	84.44 (75.48)	67.9
3.	Copper oxychloride	Blitox	29.63 (26.49)	42.96 (38.40)	45.19 (40.40)	52.22 (46.68)	55.93 (50.00)	45.2
4.	Captan	Captan	19.63 (17.55)	28.89 (25.82)	35.19 (31.46)	36.67 (32.78)	40.00 (35.76)	32.1
Mean			**35.65**	**49.35**	**63.15**	**65.56**	**70.09**	
S. Em. ±			0.75					
C.D. at 5 %			2.15					
C.V.%			1.15					

* *Average of three replications*

** *Figures in parentheses are arcsine transformed values*

Table 3: Per cent growth inhibition of *B. theobromae* by Compound fungicides at different concentrations *in vitro*

Sr. No.	Common name	Trade name	Per cent growth inhibition* Concentration (ppm)					
			100	**250**	**500**	**1000**	**1500**	Mean
1.	Caboxin + Thiram	Cosco	62.33 **(55.72)	61.67 (55.12)	54.67 (48.87)	53.33 (47.67)	42.33 (37.84)	54.87
2.	Mancozeb + Carbendazim	Sixer	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00
3.	Metalaxyl + Mancozeb	Ridomil MZ	90.37 (80.78)	92.96 (83.10)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	96.67
Mean			**84.23**	**84.88**	**84.89**	**84.44**	**80.78**	
S. Em. ±			0.32					
C.D. at 5 %			0.91					
C.V.%			0.43					

*Average of three replications

**Figures in parentheses are arcsine transformed values

DISCUSSION

Screening of fungicides *in vitro* proved first hand information about its efficacy against a pathogen. This is very useful in saving the time, labour and money of testing in the field. In the present investigations, fifteen fungicides belonging to different groups were evaluated at five different concentrations for their efficacy against *B. theobromae* by poison food technique. The result presented in table and fig. showed that all the fungicides screened significantly inhibited the growth of *B. theobromae* as compared to control. In the systemic group Carbendazim, Thiophanate methyl, Benomyl and in compound group Saaf and Master and non- systemic fungicides Mancozeb at three higher concentrations, cent per cent inhibitions were recorded. Whereas, Propinconazole at 500 ppm and 1000ppm, Fosetyl – AL at 1000 ppm were also observed cent percent inhibition. The next best in order of merit were Tridemorph at 500 and 1000 ppm, Fosetyl-AL at 250 ppm, Hexaconazole at 1000 ppm, Propinconazole at 250 and 100 ppm showed significantly superior to the control.

Sabalpara[10] reported that Bavistin and Benlate *in vitro* effective against *B. theobromae.* Carbendazim (300; 500; 1000 ppm) and Foltaf (1000; 2000; 3000 ppm) inhibited the mycelial growth of *B. theobromae* a cause of twig decline of sapota[7]. Singh *et al*[13]., evaluated efficacy of six fungicides against *B. theobromae* causing canker and dieback of pear and found that Bavistin at 200 ppm concentration was inhibitory the pathogen. Rakholiya *et al*[9]., observed mean lowest disease intensity in Cardendazim (0.1%) treatment as compared to control. Sharma and Badiyala[11] observed that

Carbendazim (0.1%) were effective to check the post harvest decay of mango fruits.

REFERENCES

1. Bordoloi, D.N. and Ganguli, D., Black spot of rose caused by *Diplocarpon rosae* Wolf. *Indian Phytopath.,* **16:** 255- 259 (1963).
2. Chakravarti, B.P., Kumar, S. and Kumar, T.B., F. A. O. *Plant Prot. Bull.* **18:** 46 (1969).
3. Chohan, J.S. and Kaur, S., Grey mold and pestalotiopsis rot of rose buds and flowers. *Indian Phytopath.,* **29:** 98 (1976).
4. Dhua, R.S., Floriculture and landscaping, Naya Prakash, Calcutta. Pp (1999).
5. Malik, R.S. and Dadlani, N.K., Rose cultivation in India. *Indian Horticulture.* **(7-9):** 27-28 (1984).
6. Pal, B.P., The rose growing in India. I.C.A.R. Publication, New Delhi. pp. 161-165 (1972).
7. Patel, P.B., Investigation on twig blight (*B. theobromae*) and occurrence of sapota disease in South Gujarat. M.Sc. (Agri.) Thesis, Submitted to Gujarat Agricultural University, Sardarkrushinagar. pp. 63-67 (1989).
8. Rao, V.R. and Srivastava, D.N., Epidemiology and control of die-back of rose incited by *Diplodia roserum* Fries. *Indian Phytopath.* **16:** 151- 157 (1963).
9. Rakholiya, K.B., Jadeja, K.B., Mayani, N.G. and Chheladiya, K.K., Chemical control of die-back disease of custard apple. *J. Mycol. Pl. Pathol.*, **38(2):** 367-368 (2008).
10. Sabalpara, A.N., Investigations regarding twig blight and die-back disease of mango caused by *B. theobromae* Pat. M.Sc. (Agri.) Thesis, Submitted to Gujarat Agricultural University, Sardarkrushinagar (1983).
11. Sharma, P. and Badiyala, S.D., Effect of pre harvest fungicidal sprays against stem end rot of mango fruits in storage caused by *Botryodiplodia theobromae* Pat. in Himachal Pradesh. *Indian J. Mycol. Pl. Phytopath.,* **24(2):** 146- 147 (2001).
12. Shukla, P. and Chaudhary, P.N., Fungi associated with die-back of roses. *Indian J. Mycol. Pl. Pathol.,* **21(2):** 213-214 (1991).
13. Singh, A., Aulakh, K.S. and Chahal, S.S., Effect of different fungicides on *B. theobromae* Pat. the causal organism of canker and die back of pear. *Indian J. Mycol. Pl. Pathol.*, **19:** 214-216 (1989).
14. Srivastava, D.N., Controlling die-back in roses. *Indian Horticulture.* **5:** 24-25 (1961).
15. Srivastava, M.P. and Tondon, R.N., Influence of temperature on *Botryodiplodia* rot of citrus, sapodilla, mango and guava. *Indian Phytopath.,* **21:** 195-197 (1968).
16. Vir, D. and Shara, R.K., Disease of rose and their fungicidal control. *Indian Horticulture.* **30:** 13-15 (1985).